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A New Satellite System for Measuring BRDF from Space

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Formation flying of satellites is at the beginning of an explosive growth curve. Spacecraft buses are shrinking to the point where we will soon be able to launch 10 micro-satellites or 100 nano-satellites on a single launch vehicle. Simultaneously, spectrometers are just beginning to be flown in space by both the U.S. and Europe. On-board programmable band aggregation will soon allow exactly the spectral bands desired to be returned to Earth. Further efforts are being devoted to radically shrink spectrometers both in size and weight. And GPS positioning and attitude determination, plus new technologies for attitude control, will allow fleets of satellites to all point at the same Earth target.

All these advances, in combination, make possible for the first time the proper measurement of BRDF from space. Previously, space BRDF's were mere composites, built up over time by viewing different types of scenes at different times, then creating catalogs of BRDF functions whose use relied upon correct "scene identification" -- the weak link. Formation-flying micro-satellites, carrying programmable spectrometers and precision-pointing at the same Earth target, can measure the full BRDF simultaneously, in real time.

This talk will review these technological advances and discuss an actual proposed concept, based on these advances, to measure Earth-target BRDF's (clouds as well as surface) across the full solar spectrum in the 2010 timeframe. This concept is part of a larger concept called Leonardo for properly measuring the radiative forcing of Earth for climate purposes; lack of knowledge of BRDF and of diurnal cycle are at present the two limiting factors preventing improved estimates of this forcing.